NON-PUBLIC?: N
ACCESSION #: 9509190356
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Oconee Nuclear Station, Unit 3 PAGE: 1 OF 7

DOCKET NUMBER: 05000287

TITLE: Drop Of Control Rod Group Due To Unknown Cause Results In Reactor Trip
EVENT DATE: 08/14/95 LER #: 95-02-00 REPORT DATE: 09/13/95

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: L. V. Wilkie, Safety Review Manager TELEPHONE: (803) 885-3518

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: AA COMPONENT: XC MANUFACTURER: B015
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On August 14, 1995, at approximately 0457 hours, Unit 3 tripped from 100% Full Power. Operators stabilized the unit at hot shutdown conditions. The unit post trip response was normal. The transient monitor and events recorder indicated that group 5 control rods had dropped into the core. Approximately three seconds later the Reactor tripped on a Reactor Protective System variable low pressure/temperature trip. An investigation revealed that there was no testing or maintenance being performed at the time of the trip. The investigation into the dropped rods has not determined the cause. The rod group 5 programmer has been sent to the vendor for further analysis. The root cause of the event is Unknown; Possible Equipment Malfunction with the rod group 5 programmer. Corrective actions include replacing the programmer and sending the suspect programmer to the vendor for analysis.

END OF ABSTRACT

BACKGROUND

The Unit 3 core EIIS:AC! design has 69 control rods EIIS:ROD! that are divided into eight groups. Groups 1 through 4 are the safety rods and are in the full out position during normal power operation to assure adequate shutdown margin. Groups 5 through 7 are regulating rods and are used to control reactor power. Group 8 rods are the axial power shaping rods and are used to help control the power imbalance in the core within specified limits.

The Control Rod Drive (CRD) System EIIS:AA! controls the operation of the control rods. Each of the regulating groups (5 through 7) has its own Programmer EIIS:XC! as a part of the regulating (normal) power supply EIIS:JX!. The Programmer accepts operational commands from the CRD System and controls the Silicon Controlled Rectifiers (SCRs) that sequentially energize the six phases of the CRD stator causing rod movement in or out. The trip function does not enter the programmer but interrupts the two redundant power sources for the programmer. If the power input/output from the programmer goes to zero, no power is supplied to the motor drive windings and the rods fall into the core.

The Reactor Protective System (RPS) EIIS:JC! is a safety related system which monitors parameters related to the safe operation of the plant. The RPS provides a two out of four logic for tripping the reactor when a predetermined set point is exceeded. one of the set points is for a variable low Reactor Coolant System EIIS:AB! pressure/temperature. This is accomplished via the reactor trip module relays EIIS:RLY! which de-energize the CRD system AC and DC breakers causing all rods to drop.

EVENT DESCRIPTION

On August 14, 1995, at approximately 0457 hours, while operating at 100% Full Power, Unit 3 Control Rod Group 5 dropped into the core. No abnormal events, testing, or maintenance procedures were in progress immediately before or at the time this event occurred.

When the control rods dropped, a reactor transient was induced. Reactor power rapidly decreased and the reactor tripped approximately three seconds after the rods dropped. The reactor tripped on a variable low pressure/temperature

Reactor Protective System (RPS) trip. The Reactor trip was due to the thermal power reduction resulting from all group 5 rods dropping into the core. Upon receiving the trip signal, all rods dropped into the core well within the maximum allowed drop time.

Post trip response was normal. The pressurizer EIIS:PZR! level decreased to 59 inches, then increased to 206 inches. Reactor Coolant System (RCS) pressure dropped to a minimum of 1798 psig then increased to a maximum of 2203 psig before controlling at approximately 2130 psig. An additional High Pressure Injection EIIS:BG! pump automatically started at approximately 0500 hours, on low seal injection flow caused by the operator opening valve 3HP-26 for additional make-up. Valve 3HP-26 was closed and the pump was stopped at approximately 0503 hours. RCS Hot and Cold Leg temperatures converged at approximately 551 F, and later stabilized at approximately 562 F. Steam Generator (SG) levels dropped to 22 inches, then stabilized and controlled at the normal low level set point of 25 inches on the startup range with Main Feedwater EIIS:SJ!. SG 3A pressure reached a maximum of 1095 psig and controlled at 1008 psig. SG 3B pressure increased to a maximum of 1100 psig then dropped and controlled at 1006 psig.

Instrument and Control (M&C) personnel, with assistance from Electrical System/Equipment Engineering, began trouble shooting to determine the cause of the control rod group 5 drop. At approximately 0800 hours Operations reset the RPS and the Control Rod Drive (CRD) trip breakers to allow I&C to test the operation of the programmer for group 5. The testing involved manually energizing the six phases of the programmer. No problems were found. A continuity check was made for the incoming power supply. Wiring and connections were inspected for any loose or deteriorated components. A check was also performed at the programmer and the Auto Bus Transfer mechanism. No unusual indications were noted. Also, Reactor Engineers assembled the data on previous events where rod group drops had occurred to determine any similarities.

At 0900 hours a post trip meeting was held to discuss the current status of the unit and determine further actions to be taken to determine the cause of the trip. I&C personnel were advised to continue trouble shooting the rod drop. Meetings

were also held at 1300 and 1800 hours. The results of the trouble shooting and investigation were discussed at each post trip meeting.

Electrical System/Equipment Engineering personnel evaluated the possible reasons that control rod group 5 could drop into the core. The

evaluation focused on the CRD system with particular emphasis on the following items/components:

* The programmer for control rod group 5
* The Electronic Trip Assembly
* Auto Bus Transfer (ABT)
* Source Interruption Device

The program, within the programmer, was compared to a standard program and found to be correct. Power cables and programmer connectors were inspected for missing, broken, or misaligned pins. No defects were noted.

The Electronic Trip Assembly is a redundant component of the CRD System which has points that are monitored by the Events Recorder. There were no points recorded prior to group 5 dropping.

The ABT assembly is used to automatically transfer from a failed main power source to the alternate power source. A Failure of the ABT assembly would cause groups 5, 6, and 7 to drop.

Any undervoltage or overvoltage condition initiated by the Source Interruption Device should open the AC CRD trip breakers. The trip breakers are monitored by the Events Recorder, and there were no points recorded prior to the group 5 drop.

In addition to the CRD system components, an evaluation of other items which could result in a unit trip were reviewed.

There were no computer points identified that indicated a trip initiated by the Anticipated Transient Without Scram/ Diversified Scram System (ATWS/DSS). A trip initiated by ATWS/DSS should drop groups 5, 6, and 7.

Personnel access to the Unit 3 Cable Room was reviewed in the Security Log and there were no entries from 0000 hours to 0530 hours. This verified that no inadvertent personnel actions in the cable room caused the trip.

The information was reported at the 1800 hours post trip meeting. The cause of the rod drop could not be determined. A decision was made to change out the group 5 programmer and send it to Babcock Wilcox Nuclear Technology for further analysis. A temporary modification was installed to measure and trend the voltage input to group 5 rods to determine if a momentary loss of power is occurring.

A Plant Operation Review Committee meeting was held at approximately 1930 hours. After discussing the investigation and corrective actions performed, the permission to restart was granted at 2049 hours.

On August 15, 1995, at 0216 hours, Unit 3 was returned to critical and at 0500 hours the Turbine/Generator was placed on line.

The rod group 5 programmer was returned to Babcock Wilcox Nuclear Technology for detailed analysis. Currently, diagnostics are in progress and results are not complete. if deficiencies are identified, the appropriate corrective actions will be implemented.

CONCLUSIONS

An investigation of the trip was initiated. Based on the investigation, it could not be determined why group 5 rods dropped into the core. Therefore, the root cause of this event is Unknown; Possible Equipment Malfunction.

During the past two years, there have been individual rod drops but no group drops resulting in a Reactor trip. However, there have been events in the past five years which involved rod drops resulting in manual or automatic Reactor trips. There was one event, in November 1990 (LER 287/90-03), where Unit 3 was manually tripped from 60% Full Power following a group 7 rod drop. The Unit was operating at 100% Full Power prior to the rod drop with no testing or maintenance in progress. The November 1990 event was due to an equipment failure where the power to the programmer was

lost. A wire lug on the power supply was discovered to be loose during a subsequent refueling outage and is believed to be the cause of the event. These equivalent lugs were inspected after the current event and found to be satisfactory. The other events occurred while performing maintenance or testing. One of the events occurred in September 1992 (LER 287/92-04), while maintenance of the Control Rod Drive System was in progress. Unit 3 tripped after rod groups 5, 6, and 7 dropped into the core. The root cause of the event was unknown.

Therefore, based on no events in the past two years and the review of the events over the past five years, this event is determined to be non-recurring.

A historical search of industry events was performed for rod drop events.

Also, NPRDS was searched for failures associated with Control Rod Drive systems. An event had occurred in 1994 at Florida Power Company's Crystal River 3 where rod group 6 solid state programmer had failed. The nature of the failure was in the output signals to the gate drives. In a detailed analysis by Babcock Wilcox Nuclear Technology (BWNT) it was determined that the processor board was not properly mated to its' receptacle. Recommendations were made to the industry to tie wrap the programmer processor boards. This was completed on Oconee Unit 3 during the last refueling outage.

The programmer was returned to the manufacturer for analysis. The rod group 5 programmer is NPRDS reportable. The manufacturer is BWNT model number 496A.

No personnel were injured and there was no release of radioactive materials or personnel over exposures involved.

CORRECTIVE ACTIONS

Immediate

1. Operations personnel stabilized the Unit at Hot Shutdown conditions.

Subsequent

1. The programmer associated with group 5 control rods was replaced.

Planned

1. Implement corrective actions based on the findings of Babcock Wilcox Nuclear Technology analysis of the group S programmer.

SAFETY ANALYSIS

While operating at 100% Full Power Unit 3 tripped coincident with the dropping of rod group 5. The reactor tripped automatically on a variable low Reactor Coolant System pressure/temperature Reactor Protective System trip. The plant response to this event was normal and as expected. No Engineered Safeguards system or Emergency Feedwater actuations were either required or received.

The dropping of one control rod is analyzed in the Final Safety Analysis

Report, section 15.7, "Control Rod Misalignment Accidents". The dropping of a group of rods, while not specifically analyzed, would make it very difficult for the reactor to successfully run back to a lower power level and not trip. In most cases an immediate reactor trip occurs on variable low pressure/temperature due to the induced power reduction. Station Operating practice requires a manual trip of the reactor if more than one control rod drops. The manual or automatic trip of the reactor terminates the initial transient and prevents the reactor from exceeding limits for monitored parameters. Operators verified the reactor had automatically tripped and per the Emergency Operating Procedure guidance, initiated the manual trip as a back up action.

Reactor tilt/imbalance related problems caused by a group drop are less significant than the consequences of a single rod drop. This is due to the distribution of the rod groups in the core.

There were no personnel injuries, releases of radioactive materials, or overexposures associated with this event. The health and safety of the public were not affected as a result of this event.

ATTACHMENT TO 9509190356 PAGE 1 OF 1

Duke Power Company J. W. Hampton
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DUKE POWER

September 13, 1995

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 287/95-02

Gentlemen:

Pursuant to 10CFR50.73 Sections (a) (1) and (d), attached is Licensee Event Report (LER) 287/95-02, concerning a control rod group drop that resulted in a reactor trip.

This report is being submitted in accordance with 10CFR50.73(a)(2)(iv).

This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

J. W. Hampton
Vice President

/ftr

Attachment

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